

CLAIMS:

1. A search method comprising the steps of:
 - a) partitioning a search region into n segments, where n is greater than 0;
 - b) searching each segment with a first predetermined algorithm;
 - c) for each segment, generating from said searching information indicating whether or not any indicator bit set to a predetermined state has been detected and the location of the indicator bit; and
 - d) using the information provided in step c) to select a winning location.
2. The search method of claim 1 further including the step of performing a predetermined action on an entity associated with the winning location.
3. The search method of claim 1 or claim 2 further including the step of determining with a second algorithm a location in the segment from which searching starts.
4. The search method of claim 3 further including the step of providing a pointer to identify the location whereat searching starts; and
stepping the pointer sequentially to access a plurality of locations within the region; and
testing indicator bit at each location to see if it is set in the predetermined state; and

7 generating a control signal for the first location encountered with the
8 indicator bit set to the predetermined state.

1 5. The method of claim 1 wherein the search region includes a plurality of
2 contiguous locations to which information can be written or deleted and an
3 indicator whose setting indicates information or no information at a selected
4 location.

5 6. The method of claim 5 wherein the information includes an identification number
6 for at least one flow queue.

7 7. The method of claim 1 wherein the searches are executed simultaneously.

8 8. The method of claim 7 wherein for step b) first it is assumed no current pointer
9 (CP) is in a segment being searched wherein searching begins at a first location
10 of the segment and ends at a last location of said segment; and

11 second it is assumed a current pointer (CP) is in the segment being
12 searched wherein searching begins at the CP location in said segment being
13 searched ending at the last location of the segment and searching begins at the
14 first location in the segment ending at the location preceding the CP.

1 9. A method to determine the next packet to forward from one of a plurality of flow
2 queues comprising:

3 (a) providing in a memory a search region including a plurality of contiguous
4 locations to which information can be written/deleted and an indicator
5 whose state indicates the present or absent of information at a selected
6 location;

7 (b) partitioning said search region into n segments, wherein n is greater than
8 0;

9 (c) determining a first location from which searching begins for each
10 segment;

11 (d) searching each segment in accordance with a first predetermined
12 algorithm;

13 (e) generating from each segment information indicating whether or not any
14 indicator set to a predetermined state has been detected in said segment
15 and location of detection;

16 (f) determining the segment in which a valid indicator is most likely located;
17 and

18 (g) examining the information in (e) and (f) with a second predetermined
19 algorithm to select a winner indicator and location.

1 10. h) The method in claim 9 further including using the information in step g) to
2 move a packet from a queue associated with the location in step g).

1 11. An apparatus including:

2 n traffic flow Queues, wherein n is greater than 0;

3 a processing complex including at least one processor that enqueues
4 packets on selected ones of the traffic flow queues;

5 a memory with a search zone having a plurality of search locations with
6 each search location including at least one indicator;

7 p segment search engines, p is greater than 1, and each of said p
8 segment search engine includes m inputs wherein each one of the m inputs
9 operatively coupled to an indicator within a group of indicators; and

10 a top search engine responsive to signals provided by the p segment
11 search engines to generate a control signal identifying a location within said
12 search zone.

13 12. The apparatus of claim 11 further including

14 a first scheduler function that monitors the traffic flow queues and periodically
15 attaches to a location in said search zone a characteristics of a traffic flow queue
16 if a packet is placed in said traffic flow queue; and

17 a second scheduler function responsive to the control signal to transmit a packet
18 from a selected Flow Queue.

19 13. The apparatus of claim 12 further including a plurality of target port Queues

2 wherein one of said target port queues received the transmitted packet.

1 14. The apparatus of Claim 12 wherein the characteristics includes the flow queue
2 identification number.

1 15. A device comprising:

2 p segment search engines, p greater than 1 and each segment search
3 engine having m inputs, m greater than 1, representing portions of a search
4 zone;

5 at least one storage location that stores information outputted from each
6 of the p segment search engines; and

7 a top search engine responsive to stored information to select and identify
8 one of the locations in said search zone.

9 16. The method of claim 1 wherein each segment includes m entries, wherein m is
10 an even power of 2.

1 17. The method of claim 1 or 16 wherein step d) further includes the step of
2 correlating outputs from each segment search with a top search algorithm to
3 select the winning location.

1 18. A method for controlling the flow of information packets within a communications

device including the steps of:

- (a) partitioning a calendar into n segments, wherein n is greater than 0;
- (b) searching each segment with a segment search algorithm to identify at least one location with an indicator set to a first state;
- (c) examining with a top search algorithm locations detected in step (b); and
- (d) selecting one of the locations as a winning location.

19. The method of Claim 18 further including the steps of determining a final winning location by concatenating an identification number for a winner segment containing the winning location to a value for the winning location within said winner segment; and

forwarding a packet from a flow queue having a same identification number matching an identification number stored at the final winning location.

20. A program product including:

a media on which a computer program is recorded, said computer program having

- (a) a set of instructions that partition a calendar into n segments, n is greater than 0;
- (b) a set of instructions that search each segment with a segment search algorithm to identify at least one location with an indicator set to a first state;

- 9 (c) a set of instructions that examine with a top search algorithm locations
10 identified in step (b); and
11 (d) a set of instructions that selects one of the locations as a winning location.

1 21. The program product of Claim 20 further including

- 2 (e) a set of instructions that determines a final winning location by
3 concatenating an identification number for a winner segment containing
4 the winning location to a value for the winning location within said winner
5 segment; and
6 (f) a set of instructions to generate and issue a signal that causes a device to
7 forward a packet from a flow queue having an identification number
8 matching an identification number stored at the final winning location.

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